3/pats

SPRAY CAN

[0001] The invention relates to a spray can which is ergonomically designed in order to ensure a secure hold of the can when spraying and is of the type specified in the preamble of claim 1, to a device which is used for manufacturing the spray can and is of the type specified in the preamble of claim 11, and to a method which is carried out to manufacture the spray can with said device and is of the type specified in the preamble of claim 13.

[0002] Spray cans of this kind are extensively used for a very wide variety of contents, for example deodorants, hairsprays, shaving foam, varnishes and paints, oils, etc. The use of these spray cans is generally made more difficult by the fact that the fingers gripping the cylindrical body of the can do not provide a sufficient hold of the can when actuating the spray button. This problem cannot be easily rectified by the known solutions used in PET drinks bottles. In these PET bottles, additional grip recesses or depressions are applied to the jacket body of the bottle to provide a better hold. However, the further requirements placed on a PET bottle are entirely different than those on a spray can which is under high pressure and contains aggressive agents. These differences are made clear in the choice of material and in the manufacturing method, with the consequence that novel solutions have to be found for the spray can.

[0003] Moreover, spray cans today are mass-produced items which can only be manufactured economically in very large quantities. For this reason there are specially developed production lines on which an optimized manufacturing process takes place. This manufacturing process is optimized to the extent that changes in the manufacture of spray cans are not really possible without incurring additional costs. If the shape of the known spray cans is to be modified, this generally entails radical changes to the entire manufacturing process, since either an additional production operation has to be implemented on the existing

machinery or additional or new machines are required.

[0004] German Utility Model DE 299 10 184 U1 discloses a spray can of said type which has a circumferential grip recess in the can body, about 3 to 4 cm from the can opening. It is true that this grip recess ensures that the spray can does not slip through the fingers when the spray button is actuated, but the overall hold of the spray can in the hand is quite awkward and unnatural. Holding the can is also made more difficult as the diameter of the can body increases. Also, the pronounced step which occurs between the deeper-lying grip recess and the higher wall of the can is a considerable disadvantage for the safety of the spray can since the material of the wall of the spray can is greatly weakened in this area.

[0005] The known spray cans from document DE 299 10 184 U1 are produced by the optimized manufacturing process described below. First, so-called pellets or blanks are punched out from sheet steel for the subsequent process. These pellets or blanks are shaped into a cylindrical hollow body by a deep-drawing method. The method generally applied is that of reverse hollow extrusion. After the manufacture of the cylindrical hollow body, the latter is painted from the inside so that the spray can has chemical resistance to the aggressive contents and propellant gases. The cylindrical hollow body is likewise printed or painted from the outside. For printing from the outside, it is important to have an object which is rotationally symmetrical. For this reason, deformation can be effected only after the cylindrical hollow body has been printed. The applied layers of paint also serve as lubricant for the subsequent deformation steps. Before the spray can to be made is deformed any further, the upper edge of the cylindrical hollow body is cut off cleanly in order thereby to ensure an exact shaping for the can opening with the collar. Finally, the upper can area with the shoulder and with the can opening and the collar is formed from the cylindrical hollow body. This deformation is generally done by several production steps carried out in a press. In this press, the cylindrical hollow bodies are made into a finished spray can without

spraying system. The individual spray cans are then tied together in a bundle and made ready for transport. Another company is generally responsible for filling the spray cans and applying the spraying systems.

[0006] The object of the invention is therefore, in the first instance, to develop an easy-to-handle spray can which is of the type specified in the preamble of claim 1, is ergonomically shaped, and yet presents no disadvantage in terms of safety. According to the invention, this is achieved by the measures which are set forth in the characterizing part of claim 1 and which have the following particular significance.

[0007] According to the invention, the spray can, in contrast to the spray cans known from the prior art, has an additional shaping area in the upper can portion, which additional shaping area may extend above the whole shoulder area of the spray can. In this shaping area, the cross section of the spray can is of a different configuration than the almost circular cross section of the lower can portion. That is to say, the different cross sections along the longitudinal extent of the spray can generally do not have the circular cross section that is present in the lower can portion. This shaping area, insofar as it extends above the shoulder area, merges seamlessly into the standardized can opening. Consequently, in the spray cans according to the invention which have a standardized can opening, standardized spraying systems can also be used even when they have no cylindrical body in the shaping area.

[0008] The spray can advantageously has a substantially constant wall thickness about the circumference of the cross section and along its height (longitudinal extent), i.e. the wall thickness is constant in the radial and axial extents. This above all ensures a high level of safety for filled spray cans which are under high pressure.

[0009] It is a further object of the invention to provide a device of the aforementioned type which is such that the spray can is able to be manufactured without any substantial changes in a conventional but modified production operation. According to the invention, this is achieved by the measures which are set forth in the characterizing part of claim 11 and to which the following particular significance is attached.

[0010] The dies of the device which are used for forming the upper can portion are configured, according to the invention, in such a way that the shaping area of the spray can may additionally be formed by their chosen contours. Thus, the die not only forms the shoulder area and the can opening with collar for the insertable spraying system, but also the additional shaping area. For this purpose, the dies in the different cross sections in the shaping area have circumferences of the contours which are not of a circular configuration. In the process of formation of the upper can portion, the contours of the dies, thus geometrically modified, also effect the formation of the shaping area.

[0011] It is likewise an object of the invention to develop a modified method of the aforementioned type which permits economic manufacture of the spray cans according to the invention in large batch numbers. This is achieved essentially through the modified method step in the characterizing part of claim 13.

[0012] In this modified method step, the upper can portion with the shoulder area and with the can opening with collar and the additional shaping area is formed by the device as claimed in claim 11 or 12. Thus, in the method, no additional production operation is employed compared to conventional production methods instead the spray cans 10 according to the invention are manufactured by the changed or modified production operation. Thus, the known production method for the conventional spray cans (from the prior art) is largely retained so as to affect the optimized sequence as little as possible. In this way, the spray cans

according to the invention can also be manufactured in an economical manner.

[0013] Advantageously, the production operation for creating the upper can portion with the shaping area is the last production operation in the process for manufacturing unfilled spray cans.

[0014] Further measures and advantages of the invention will become clear from the dependent claims, from the description below, and from the drawings. An illustrative embodiment of the invention is depicted in the drawings, in which:

[0015] Fig. 1 shows a front view of a spray can in an ergonomic V-shape;

[0016] Fig. 2 shows a side view of the spray can from Fig. 1;

[0017] Fig. 3 shows a plan view of the spray can from Figures 1 and 2;

[0018] Fig. 4.1 shows a longitudinal section through a front view of a die in a device for creating the upper can portion with shaping area of the spray can in a first production step;

[0019] Fig. 4.2 shows a longitudinal section through a side view of the die from Fig. 4.1;

[0020] Fig. 5.1 shows a comparable longitudinal section to Fig. 4.1 through a further die for a second production step, see also section V.1 – V.1 from Fig. 5.3;

[0021] Fig. 5.2 shows a longitudinal section comparable to Fig. 4.2

through the die from Fig. 5.1, see also section V.2 – V.2 from Fig. 5.3;

[0022] Fig. 5.3 shows cross section V.3 – V.3 through the die from Fig. 5.1;

[0023] Fig. 6.1 shows a plan view of a rotatable clamp plate as part of a device for production of the upper can portion with shaping area;

[0024] Fig. 6.2 shows a side view of the device with the clamp plate and with the die plate with the dies arranged on it.

[0025] The spray can 10 is made of metal and has a lower can portion 11 and an upper can portion 13. The lower can portion 11 contains a bottom 12 and an almost cylindrical can wall, such that the cross sections of the spray can 10 in the area of the lower can portion 11 are of circular configuration. All cross sections in the area of the lower can portion 11 are circular, with the same surface area. The upper can portion 13 has a shoulder area 14 and a can opening 15 with a collar 16 for an insertable spraying system. Previously known spray cans are also of cylindrical configuration in the upper can portion 13, such that their cross sections in this area are also circular. It is also considered circular when the circumference of the circle cross sections has small indents or ridges as are present, for example, in a cross section in the area of the sinusoid grip recess from the known document DE 299 10 184 U1.

[0026] The shoulder area 14 represents a transition area in which the greater cross-sectional area of the cylindrical can body tapers continuously into the smaller cross-sectional area of the can opening. In the known spray cans from the prior art, different shoulder areas 14 are known which have a round shoulder, inclined shoulder or ridged shoulder. However, a cross section in the known shoulder areas 14 is also always circular.

[0027] In the spray can 10 according to the invention, the upper can portion 13 additionally includes a shaping area 17 which may also extend above the shoulder area 14. Cross sections in the shaping area 17 of the spray can 10 are differently configured than the almost circular cross sections of the lower can portion 11.

[0028] In Figures 1 to 3, a spray can 10 is shown which has oval cross sections in the shaping area 17 of the spray can 10. The V-shaped configuration of the spray can 10 can be seen from Fig. 1. This upwardly widening shape of the spray can 10 guarantees ergonomic handling of the spray can 10. In this way, slipping of the spray can 10 during its use, particularly when actuating the spraying system with slippery fingers, is greatly reduced. As can further be seen from Figures 1 to 3, the lower can portion 11 has a constant circular cross section. In this area of the lower can portion 11, the spray can 10 is gripped by a clamping device 23, in a production operation described in more detail below.

[0029] The spray can 10 advantageously has a substantially constant wall thickness about the circumference of the cross section and along the height (longitudinal extent) of the wall of the spray can. That is to say, the wall thickness of the spray can 10 is substantially constant in the radial extent and axial extent. In this way, a high degree of safety is achieved for the spray can 10, in particular at a high filling pressure. This is of great importance since the filling pressure may be strongly influenced by external circumstances, for example temperature fluctuations. Thus, the spray can 10 must also withstand special demands, for example if it is exposed to direct sunlight in a car.

[0030] To achieve a degree of safety comparable to that of conventional cylindrical spray cans, it is proposed that the circumference of the circular cross section from the lower can portion 11 is equal in terms of size to the circumference of the differently configured cross section in the shaping area 17. This described

measure ensures a direct influence on the desired constant wall thickness of the spray can 10. Thus, considerable deformations, as are known from DE 299 10 184 U1, are avoided, and possible weak points of the spray can 10 are eliminated in advance.

[0031] The surface of the differently configured cross sections in the shaping area 17 is advantageously oval or ellipsoid. Ergonomic handling is ensured by this shaping of the spray can 10, and at the same time the maximum degree of safety is achieved. It is advisable to avoid especially narrow radii in the circumference of the cross section in the shaping area 17.

[0032] Likewise, the surface of the differently configured cross section in the shaping area 17 can possess any other shape and can thus approximate to a triangle or rectangle, in which case too the corners are realized by the largest possible radii. By virtue of the freely selectable shaping of the spray can 10, it is possible for any other ergonomic handling of the can to be achieved with, at the same time, a pleasing appearance.

[0033] Since, as has already been mentioned, spray cans today are mass-produced items, it is expedient for the spray can 10 to have a standardized can opening 15 into which standardized spraying systems can be inserted. For this purpose, the can opening 15 is generally of a circular configuration. This also applies to the collar 16 since it too is of importance for the standardized spraying systems.

[0034] The spray can 10 with an inserted spraying system is advantageously suitable for a filling pressure of between 5 and 35 bar, but in particular for a filling pressure of between 10 and 20 bar or for a filling pressure of between 12 and 18 bar. As has already been mentioned, however, the filling pressure may lie appreciably above said values if the spray can 10 is exposed to

intense heat.

[0035] To be able to produce the spray can 10 in a cost-effective manner and according to a known, modified manufacturing method, it is advisable for the metal of the spray can 10 to be of tinplate or aluminum. Of course, any alloys of tinplate or aluminum are also included here.

[0036] To manufacture a spray can 10 according to the invention (as claimed in one of claims 1 through 10), the device 20 comprises one or more dies 24 for producing the upper can portion 13 with the shoulder area 14 and with the can opening 15 with the collar 16 from a cylindrical hollow body 25 with bottom 12, the shape of the upper can portion 13 being determined by the contours 30 of the die 24. This device 20 is used for pressing the spray can 10 from a cylindrical hollow body 25a with bottom 12. The contours 30 of the die 24 are configured in such a way that the differently configured shaping area 17 of the spray can 10 may additionally be formed since the circumferences 31 of the contours 30 are not of a circular configuration at different cross sections in the shaping area 17 of a die 24. Thus, the differently configured shaping area 17 in the upper can portion 13 is also produced directly by the device 20.

[0037] This production operation, however, consists of individual production steps, as are indicated in Figures 6.1 and 6.2. In a first step, a cylindrical hollow body 25a with bottom 12 is fitted into a clamping device 23 on the rotatable clamp plate 21 of the device 20. Thereafter, the displaceable die plate 22, with the dies 24 secured on it, moves towards the clamp plate 21 (see arrow 27). This is the first production step for the formation of the upper can portion 13 for manufacturing the spray can 10. In this way, the shape of the cylindrical hollow body 25a is converted to the shape of the cylindrical hollow body 25b. After the die plate 22 has moved back to its starting position, the clamp plate 21 rotates in the direction of rotation 26 through a defined angle. A new cylindrical hollow body 25a

is then clamped on the clamp plate 21, and the already described production step begins anew. Now, however, not only is the cylindrical hollow body 25a shaped, but also the already created cylindrical hollow body 25b is further shaped by again moving the die plate 22 with the applied dies 24 to the clamp plate 21. By means of this second production step, which however is similar to the first one, the cylindrical hollow body 25b is formed into the cylindrical hollow body 25c by the die 24b. Once the die plate 22 is in its starting position, the clamp plate 21 is again turned in steps in the direction of rotation 26, and the production step starts anew. Since up to 35 cylindrical hollow bodies 25 can be mounted on the clamp plate 21, this production operation can also consist of a total of 35 forming steps for the spray can 10. By means of this stepwise forming of the cylindrical hollow bodies 25, a finished spray can 10 is provided at the end. As has already been made clear, the device 20 consequently also contains the rotatable clamp plate 21 with the clamping devices 23 and the displaceable die plate 22 with the recesses for the dies 24.

[0038] The contours 30 at different cross sections in the shaping area 17 of a die 24 advantageously have circumferences 31b of the same length. In this way, the specific shaping in the shaping area 17 of the spray can 10 is achieved.

[0039] Figures 4.1 and 4.2 show a first die 24a which is mounted on the device 20, in particular on a displaceable die plate 22. In Fig. 1, this die 24a is shown as a longitudinal section through a front view, thus making clear the contour 30a. This die 24a serves for the first forming step of the cylindrical hollow body 25a. It will be clearly seen from Figures 4.1 and 4.2 that the contour 30a in the downwardly open passage has an oval cross section (see different diameter in the shaping area 17). This cross section narrows toward the top and becomes circular for the can opening 15. Figures 5.1 to 5.3 show a second die which is used for the second production step for the cylindrical hollow body 25b. As can be seen from Figures 5.1 and 5.2, the collar 16 is partially formed on the can

opening 15 with this die 24b. The circumference 31b of the contour 30b in the cross section V.3 – V.3 can be clearly seen from Fig. 5.3. This circumference 31b of the contour 30b is of oval configuration.

[0040] It should be noted at this point that the illustrated dies 24a, 24b are only examples and so do not necessarily have to be used in the form shown in the process for production of spray cans 10. However, they are intended to illustrate the principle of the individual forming steps in the production operation e).

[0041] The invention further relates to a method for manufacturing the spray can 10, comprising at least the following production operations which themselves consist of several production steps:

a) producing an almost cylindrical hollow body 25a with bottom 12 from a pellet or blank,

b) painting the inside of the cylindrical hollow body 25a,

c) printing or painting the cylindrical hollow body 25a on the outside,

d) cutting off the upper edge of the cylindrical hollow body 25a for exact forming of the collar 16 of the can opening 15, and

e) producing the upper can portion 13 with the shoulder area 14 and with the can opening 15 with the collar 16.

[0042] In the last-mentioned production operation e) for creating the upper can portion 13 with the shoulder area 14 and with the can opening 15 with the collar 16, the device 20 as claimed in claim 11 or 12 is used, by which means the differently configured shaping area 17 of the upper can portion 13 can also be

formed. Consequently, this modified manufacturing method for the spray can 10 is similar to the known manufacturing method for spray cans from the prior art. Only the production operation e) differs by the use of the device 20 according to the invention. In this way, the optimized manufacturing process for the spray cans known from the prior art is not changed. Consequently, no additional costs are incurred in manufacturing the spray can 10 with the shaping area 17. At this point it must also be noted that the sequence of production operations a) to e) in the aforementioned method is not limited to the illustrated sequence, and instead can also vary. It is likewise possible for a production operation to be interrupted in order to perform another production operation. Thus, it is known from the prior art to interrupt production operation e) for production operation d).

[0043] In the method according to the invention, the production operation a) for producing an almost cylindrical hollow body 25a with the bottom 12 is advantageously achieved by an inexpensive deep-drawing method. In particular, the already mentioned method of reverse hollow extrusion should be considered here. Thus, the forming of the upper can portion 13 with the shaping area 17 can also be realized by a simple pressing method.

[0044] It is likewise advantageous if production operation e) for creating the upper can portion 13 with the shaping area 17 is the last production operation in the process for manufacturing unfilled spray cans 10. After this production operation e), the produced spray cans c) are bundled together by a large clamping belt and formed into stacks for transport to a filling center. For this purpose, it is recommended to configure the spray cans 10 in such a way that the shapes of the spray cans 10 match and compensate each other during bundling, i.e. the spray cans lie closely contiguous, since otherwise the bundle becomes thicker toward the top or bottom and would thus lose the hold by the clamping belt.

[0045] It remains to be noted that the embodiments of the spray can 10 and

of the device 20 shown here are only illustrative examples of the invention. The latter is however not restricted to these. It will be appreciated that the forms and parts of the invention which are shown may be present also in other configurations having similar properties to those described here. Nor is a distinction made between a spray can and an aerosol can.

List of reference numbers

10	spray can
11	lower can portion
12	bottom
13	upper can portion
14	shoulder area
15	can opening
16	collar
17	shaping area
20	device
21	rotatable clamp plate
22	displaceable die plate
23	clamping device
24a	die for 1st production step
24b	die for 2nd production step
24c	die for 3rd production step
25a	cylindrical hollow body before 1st production step
25b	cylindrical hollow body before 2nd production step
25c	cylindrical hollow body before 3rd production step
26	arrow for direction of rotation of 21
27	arrow for longitudinal movement of 22
30a	contour of die 24a
30b	contour of die 24b
31b	circumference of contour 30b